

## **REMARKS**

This document responds to an Office action dated 11/18/2010.

Claims 1, 3-7, and 9-18 were presented for examination and were rejected. The applicants respectfully request reconsideration in light of the amendments and the following remarks.

Claims 2 and 8 were previously canceled.

Claim 4 is currently canceled and claims 1, 3, 7, 10, 12, 14, 15, 16, and 18 are currently amended without prejudice, and the applicants respectfully retain the right to re-present any or all these claims with or without these amendments in this or another application.

### **Overview of The Distinguishing Characteristics of the Present Invention**

In support of the arguments below, the applicants distinguish a number of important characteristics of the present invention, some of which were previously articulated.

**First**, regarding terminology, "term" according to applicants' specification "may comprise a word or a word class." (Specification, page 7, lines 12-13; see also page 3, line 9). The incoming natural-language word(s) to be classified by the joint classifier are to be distinguished from words in a corpus. Thus, for clarity, the claim language recites "word" in reference to the former (incoming natural-language word) and "word-term" in reference to the latter (in a corpus).

**Second**, in contrast to prior art, the present invention discloses a distinctive combination of at least two different kinds of sources of terms for the disclosed joint classifier:

[T]he joint classifier 112 uses a joint classification technique, based on **both** word terms **and** word term classes, to classify natural language speech received via one or more incoming calls or other communications from network 104. The word terms and word term classes are generally referred to herein as words and classes respectively.

(Specification, page 4 line 27 to page 5 lines 1-3 (emphasis added).

. . . .

Words **and** word classes [are] utilized to provide the respective word information and word class information for use in the joint classifier . . . .

(Specification, page 2, lines 25-27 (emphasis added)).

. . . .

The illustrative embodiment utilizes an automatic word class clustering algorithm to generate word classes from a training corpus, and information gain (IG) based term selection **to combine word information and word class information** for use by the joint classifier.

(Specification, page 7, lines 1-3 (emphasis added)).

The combination of at least one source of word terms and at least one source of word-classes plays a key role. (See also Specification, Figure 5 and accompanying text at page 11). This distinctive combination of terms tends to ameliorate the defects of classifying based on automatically generated word classes. (Specification, page 9, lines 13-19).

**Third**, the present invention uses information-gain (IG) calculations to select only certain terms from the above-mentioned combination of terms before it executes the classification functions of the joint classifier.

**Fourth**, the present application discloses a unique feature – namely that the IG-based selection of terms is from the distinctive combination of terms. Therefore, both word-terms and class-terms are available in this combination to be selected; the selected terms are then populated into a term-category matrix that ultimately directs the routing of the communication. The term-category matrix is thus made far more robust than prior art disclosures.

**Advantageous Experimental Results.** The illustrative embodiment achieves “an average error reduction of approximately 10% to 15% over baseline word-only and class-only approaches.” (Applicants’ Specification, page 13, line 16-19). This is a substantial advantage that is achieved, at least in part, through the use of the distinctive characteristics of the present invention. In particular, as the inventors point out, using the combination of terms from two kinds of sources of terms is at least in part responsible for the achieved error reduction. Moreover, the combination of terms does not stand alone: the combination becomes the source from which terms are selected and analyzed, resulting in the achieved improvements.

### **35 U.S.C. § 103 Rejection of Claims 1, 3, 5-7, and 9-18**

Claims 1, 3, 5-7, and 9-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Li et al., “Improving Latent Semantic Indexing Based Classifier with

Information Gain," 7<sup>th</sup> International Conference on Spoken Language Processing, Sep. 2002 (referred to simply as "Li" in the pending office action, but hereinafter "**Li-2002**"), in view of Diab et al., "An Unsupervised Method for Word Sense Tagging Using Parallel Corpora," Proceedings of the 40<sup>th</sup> Annual Meeting of the Ass'n for Computational Linguistics, July 2002 (hereinafter "**Diab**"). The applicants respectfully submit that the amended claims overcome this rejection.

**Claim 1** as amended recites a method comprising:

identifying, by a processor-based device, a word that (i) is received in a communication, and (ii) is a natural-language word, wherein the processor-based device is to determine a category for the communication;

**combining (i) at least one set of word-terms, and (ii) at least one set of word-classes** that is generated from an automatic word-class clustering algorithm, wherein a term is one of a word-term and a word-class, and **wherein the combining results in a combination of terms;**

**selecting** by the processor-based device a plurality of terms **from the combination of terms**, wherein the selecting is based on an information-gain value of those terms in the combination **that correspond to the word;**

generating by the processor-based device a matrix that comprises a plurality of categories and the plurality of terms, wherein each term in the matrix is associated with at least one category; and

determining from the matrix, **based on a joint classification of the word** by the processor-based device, the category for the communication.

(emphasis added)

Nowhere do the cited references, taken alone or in combination, teach, suggest, or motivate what amended claim 1 recites in salient part – namely:

- identifying a word received in a communication in order to determine a category for the communication, by
- combining (i) at least one set of word terms, and (ii) at least one set of word classes that is generated from an automatic word-class clustering algorithm into a combination of terms, and
- selecting from the combination of terms based on IG values relative to the word, such that

- a category for the communication is determined from, based on a joint classification of the word.

As explained above and in applicants' specification, the use of a combination of terms from multiple and diverse kinds of sources, and particularly the combination of word-terms and word-classes, provides the present invention with added robustness and significant performance improvement over the prior art.

The Office concedes, and the applicants agree that Li-2002 does not suggest or motivate the combination of terms. (Office Action, page 10). The Office Action asserts that Diab "teaches/suggests generating . . . a combination of terms." (Office Action, page 4). The Office Action further asserts that applicants "did not address what the rejection stated Diab did teach," explaining that the "rejection is based on a combination of references, and each reference contributes a portion of information to the combination." (Office Action, page 5 (emphasis in original)). The Office Action further adds that "Lin" (presumably the Office was referring to Li-2002) "was applied to teaching the 'selecting' limitation" while "Diab was only applied to teach an alternate source of word-term and word-class information." (Office Action, page 5).

Contrary to the assertions of the Office Action, the applicants respectfully submit that Diab does not cure the fatal deficiencies of Li-2002, and vice versa, for the several reasons set forth below. Moreover, there is no motivation to combine these two references.

**First**, the applicants have amended the "identifying" and "utilizing" language (see Office Action, page 2) to better clarify the relationships among the elements of amended claim 1.

**Second**, the Office impermissibly employs a "template in hindsight" strategy when citing references, with respect to the claimed distinctive combination of terms, such that "each reference contributes a portion of information to the combination." This approach resembles a classic analysis by hindsight, wherein the present invention is used as a template into which the Office form-fits isolated snippets to create the whole. As applied to the "combination of terms" element of the pending claims, this strategy is, respectfully, impermissible.

Whereas the applicants have stressed that a significant advantage to the present invention is derived from using the combination of terms that comprises both word-terms and class-terms such that the combination of terms becomes the source of subsequent term

selection and analysis, the Office has failed to cite a reference that teaches, suggests, or motivates such a combination of different kinds of terms. Instead, the Office uses the pending claim as a template and the Office combines two disparate references to create the very element that confers a major advantage to the present invention. Respectfully, neither reference teaches, suggests, or motivates forming a combination of terms that comprises the different kinds of terms recited by claim 1 – and using the combination according to the method of claim 1; therefore, cutting and pasting two disparate references to achieve this result cannot be deemed a proper basis for rejection. The limitation of amended claim 1 reciting the “combining . . . [that] results in a combination of terms” is therefore a novel and nonobvious feature.

**Third**, the applicants respectfully reiterate that the “selecting” element of the pending claim is inextricably tied into the “combining . . . [that] results in a combination of terms” element, because in contrast to any cited references, the method of claim 1 recites that terms are selected “**from the combination of terms**.” The selection from the combination of terms thus carries meaning that is absent in both Diab and Li-2002. For example, the availability of both word-terms and class-terms as possible candidates for selection is a meaning that neither Diab nor Li-2002 contemplate. The applicants respectfully submit that, therefore, the limitation of claim 1 that recites “selecting . . . a plurality of terms from the combination of terms” is itself a patentable limitation in its own right.

In the interest of avoiding repetition, the applicants will not reiterate the analysis of Diab that was submitted in a previous response. However, applicants note that Diab is directed at solving a quite distinct problem bearing no relationship to the present invention, and therefore it is not obvious to consult Diab, much less to combine it with Li-2002.

**Fourth**, the applicants respectfully disagree that it would have been predictable to one skilled in the art that the method of the pending claim achieves advantageous results. The Office Action asserts that

a substitution could be performed to obtain **predictable results** of selecting words and word-class information (as per Li) from a data entity that includes the words and word-class information . . . Li explicitly teaches **selection from something**, and therefore one of ordinary skill in the art would recognize that **some sort of analysis of a data entity to derive word-terms and word-classes is possible**.

(Office Action, page 7).

The applicants respectfully dispute this rationale, because it is speculative and conclusory. Combining two different kinds of terms (word-terms and class-terms) is not taught in the cited references and there is no reason to predict that the results would achieve the performance improvements cited by the present inventors. The results could just as easily have been the same or worse, or costlier, or otherwise disadvantageous over the prior art. It is just as conceivable that a combination of terms would result in a more "confused" outcome, because of the diverse kinds of terms being combined together.

Moreover, asserting that because a reference cites "selection from something," "some sort of analysis . . . is possible" hardly provides a reasoned and clear articulation of why the claimed limitations lack inventiveness. (See MPEP, § 2141 III (citing KSR)).

**Fifth**, the applicants submit other amendments to the claims to more clearly distinguish the method of amended claim 1 from the combined prior art. For example, reciting "determining from the matrix, based on a joint classification of the word by the processor-based device, a category for the communication" is one such limitation. Also, the limitation of claim 4 has been incorporated into claim 1, reciting that a set of word-classes "is generated from an automatic word-class clustering algorithm."

For all these reasons, the applicants respectfully submit that amended claim 1 overcomes the rejection and is allowable over the cited references.

Because they depend from claim 1, claims 3, 5-7, and 9 are likewise allowable. Moreover, the recitation of additional patentable features in these claims forms an added basis for their patentability.

**Claims 10, 12, 15, and 18.** Independent claims 10, 12, 15, and 18, as amended, comprise the salient limitations recited above with respect to claim 1. They are not recited here in the interest of saving space. For at least the same reasons given in support of claim 1, the applicants respectfully submit that these claims are likewise allowable over the cited references.

Because they depend from these independent claims, claims 11, 13-14, and 16-17 are likewise allowable. Moreover, the recitation of additional patentable features in these claims forms an added basis for their patentability.

**35 U.S.C. § 103 Rejection of Claim 4**

Claim 4 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Li-2002 in view of Diab as applied to claim 1, in view of of Sakai et al., U.S. Patent No. 7,099,819 B2 (hereinafter "Sakai"). The applicants respectfully traverse.

Claim 4 depends from claim 1. Sakai does not cure the deficiencies of Li-2002 and Diab with respect to claim 1.

For example, Sakai's method of word clustering (to create word classes) does not teach, suggest, or motivate a combination of terms that comprises both word classes and individual word terms – in contrast to the salient limitation of claim 1.

Therefore, claim 4 is allowable over the cited references. Moreover, the recitation of additional patentable features in this claim forms an added basis for its patentability.

**Request for Reconsideration Pursuant to 37 C.F.R. 1.111**

Having responded to each and every ground for objection and rejection in the last Office action, applicants respectfully request reconsideration of the instant application pursuant to 37 C.F.R. 1.111 and request that the Examiner allow all of the pending claims and pass the application to issue.

If there are remaining issues, the applicants respectfully request that Examiner telephone the applicants' attorney so that those issues can be resolved as quickly as possible.

Respectfully,

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